



## Material Safety Data Sheet

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### SECTION 1: PRODUCT AND COMPANY IDENTIFICATION

**PRODUCT NAME:** FC-77 FLUORINERT Brand Electronic Liquid  
**MANUFACTURER:** 3M  
**DIVISION:** 3M Specialty Materials

**ADDRESS:** 3M Center  
 St. Paul, MN 55144-1000

**EMERGENCY PHONE:** 1-800-364-3577 or (651) 737-6501 (24 hours)

**Issue Date:** 09/03/2002  
**Supersedes Date:** 07/31/2002

**Document Group:** 10-3791-0

#### Product Use:

**Intended Use:** For industrial use only. Not intended for use as a medical device or drug.  
**Specific Use:** Testing Fluid or Heat Transfer Fluid for Electronics

### SECTION 2: INGREDIENTS

<u>Ingredient</u>	<u>C.A.S. No.</u>	<u>% by Wt</u>
PERFLUORO COMPOUNDS, (PRIMARILY COMPOUNDS WITH 8 CARBONS)	86508-42-1	100

### SECTION 3: HAZARDS IDENTIFICATION

#### 3.1 EMERGENCY OVERVIEW

**Specific Physical Form:** Liquid

**Odor, Color, Grade:** Colorless, odorless liquid.

**General Physical Form:** Liquid

**Immediate health, physical, and environmental hazards:** None known.

#### 3.2 POTENTIAL HEALTH EFFECTS

**Eye Contact:**

Contact with the eyes during product use is not expected to result in significant irritation.

**Skin Contact:**

Contact with the skin during product use is not expected to result in significant irritation.

**Inhalation:**

No health effects are expected.

**Ingestion:**

No health effects are expected.

**3.3 POTENTIAL ENVIRONMENTAL EFFECTS**

This compound is completely fluorinated (perfluorinated), or it contains perfluorinated portions. Perfluoroalkyl groups resist degradation in most natural environments. This low-solubility substance has insignificant toxicity to aquatic organisms (Lowest LL50 or EL50 is >1000 mg/L). LL50 (Lethal Level) and EL50 are similar to LC50 and EC50, but tests the water phase from incompletely-miscible mixtures. Take precautions to prevent direct release of this substance to the environment.

**ATMOSPHERIC FATE:**

Perfluoro compounds (PFCs) are photochemically stable and expected to persist in the atmosphere for more than 1000 years. PFCs have high global warming potentials (GWP), exceeding 5000 (100-yr-ITH). The Ozone Depletion Potential (ODP) is Zero.

**SECTION 4: FIRST AID MEASURES****4.1 FIRST AID PROCEDURES**

The following first aid recommendations are based on an assumption that appropriate personal and industrial hygiene practices are followed.

**Eye Contact:** Flush eyes with large amounts of water. If signs/symptoms persist, get medical attention.

**Skin Contact:** Wash affected area with soap and water. If signs/symptoms develop, get medical attention.

**Inhalation:** If signs/symptoms develop, remove person to fresh air. If signs/symptoms develop, get medical attention.

**If Swallowed:** No need for first aid is anticipated.

**SECTION 5: FIRE FIGHTING MEASURES****5.1 FLAMMABLE PROPERTIES**

<b>Autoignition temperature</b>	<i>Not Applicable</i>
<b>Flash Point</b>	<i>Not Applicable</i>
<b>Flammable Limits - LEL</b>	Nonflammable
<b>Flammable Limits - UEL</b>	Nonflammable

## 5.2 EXTINGUISHING MEDIA

Material will not burn.

## 5.3 PROTECTION OF FIRE FIGHTERS

**Special Fire Fighting Procedures:** Wear full protective clothing, including helmet, self-contained, positive pressure or pressure demand breathing apparatus, bunker coat and pants, bands around arms, waist and legs, face mask, and protective covering for exposed areas of the head. Water may be used to blanket the fire. Exposure to extreme heat can give rise to thermal decomposition.

**Unusual Fire and Explosion Hazards:** No unusual fire or explosion hazards are anticipated. No unusual effects are anticipated during fire extinguishing operations. Avoid breathing the products and substances that may result from the thermal decomposition of the product or the other substances in the fire zone. Keep containers cool with water spray when exposed to fire to avoid rupture.

**Note: See STABILITY AND REACTIVITY (SECTION 10) for hazardous combustion and thermal decomposition information.**

## SECTION 6: ACCIDENTAL RELEASE MEASURES

**Accidental Release Measures:** Observe precautions from other sections. Call 3M- HELPS line (1-800-364-3577) for more information on handling and managing the spill. Evacuate unprotected and untrained personnel from hazard area. The spill should be cleaned up by qualified personnel. Ventilate the area with fresh air. Contain spill. Working from around the edges of the spill inward, cover with bentonite, vermiculite, or commercially available inorganic absorbent material. Mix in sufficient absorbent until it appears dry. Collect as much of the spilled material as possible. Clean up residue with an appropriate organic solvent. Read and follow safety precautions on the solvent label and MSDS. Place in a metal container approved for transportation by appropriate authorities. Seal the container. Dispose of collected material as soon as possible.

**In the event of a release of this material, the user should determine if the release qualifies as reportable according to local, state, and federal regulations.**

## SECTION 7: HANDLING AND STORAGE

### 7.1 HANDLING

Avoid skin contact with hot material. For industrial or professional use only. No smoking: Smoking while using this product can result in contamination of the tobacco and/or smoke and lead to the formation of the hazardous decomposition products mentioned in the Reactivity Data section of this MSDS. Store work clothes separately from other clothing, food and tobacco products. Use general dilution ventilation and/or local exhaust ventilation to control airborne exposures to below Occupational Exposure Limits. If ventilation is not adequate, use respiratory protection equipment.

### 7.2 STORAGE

Store away from heat. Keep container tightly closed. Keep container in well-ventilated area.

## SECTION 8: EXPOSURE CONTROLS/PERSONAL PROTECTION

### 8.1 ENGINEERING CONTROLS

Provide appropriate local exhaust when product is heated. Provide appropriate local exhaust ventilation on open containers. For those situations where the fluid might be exposed to extreme overheating due to misuse or equipment failure, use with appropriate local exhaust ventilation sufficient to maintain levels of thermal decomposition products below their exposure guidelines.

## 8.2 PERSONAL PROTECTIVE EQUIPMENT (PPE)

### 8.2.1 Eye/Face Protection

Avoid eye contact.

The following eye protection(s) are recommended: Safety Glasses with side shields.

### 8.2.2 Skin Protection

Avoid skin contact with hot material. Wear appropriate gloves, such as Nomex, when handling this material to prevent thermal burns. Avoid skin contact.

Select and use gloves and/or protective clothing to prevent skin contact based on the results of an exposure assessment. Consult with your glove and/or protective clothing manufacturer for selection of appropriate compatible materials.

Gloves made from the following material(s) are recommended: Nitrile Rubber.

### 8.2.3 Respiratory Protection

Under normal use conditions, airborne exposures are not expected to be significant enough to require respiratory protection. Avoid breathing of vapors, mists or spray.

Select one of the following NIOSH approved respirators based on airborne concentration of contaminants and in accordance with OSHA regulations: Half facepiece or fullface air-purifying respirator with organic vapor cartridges. Consult the current 3M Respiratory Selection Guide for additional information or call 1-800-243-4630 for 3M technical assistance. If thermal degradation products are expected, use fullface supplied air respirator.

### 8.2.4 Prevention of Swallowing

Do not eat, drink or smoke when using this product. Wash exposed areas thoroughly with soap and water.

## 8.3 EXPOSURE GUIDELINES

None Established

## SECTION 9: PHYSICAL AND CHEMICAL PROPERTIES

<b>Specific Physical Form:</b>	Liquid
<b>Odor, Color, Grade:</b>	Colorless, odorless liquid.
<b>General Physical Form:</b>	Liquid
<b>Autoignition temperature</b>	<i>Not Applicable</i>
<b>Flash Point</b>	<i>Not Applicable</i>
<b>Flammable Limits - LEL</b>	Nonflammable
<b>Flammable Limits - UEL</b>	Nonflammable
<b>Boiling point</b>	90 - 107 °C
<b>Density</b>	1.8 g/ml
<b>Vapor Density</b>	Approximately 14 [ <i>@ 20 °C</i> ] [ <i>Ref Std: AIR=1</i> ]
<b>Vapor Pressure</b>	Approximately 42 mmHg [ <i>@ 20 °C</i> ]
<b>Specific Gravity</b>	Approximately 1.8 [ <i>Ref Std: WATER=1</i> ]
<b>pH</b>	<i>Not Applicable</i>
<b>Melting point</b>	<i>Not Applicable</i>
<b>Solubility in Water</b>	Nil
<b>Evaporation rate</b>	> 1 [ <i>Ref Std: BUOAC=1</i> ]
<b>Volatile Organic Compounds</b>	Exempt
<b>Percent volatile</b>	Approximately 100 %
<b>VOC Less H2O &amp; Exempt Solvents</b>	Exempt
<b>Viscosity</b>	0.8 centistoke [ <i>@ 20 °C</i> ]

**SECTION 10: STABILITY AND REACTIVITY**

**Stability:** Stable.

**Materials and Conditions to Avoid:** Finely divided active metals; Alkali and alkaline earth metals; Heat(greater than 200 °C)

**Hazardous Polymerization:** Hazardous polymerization will not occur.

**Hazardous Decomposition or By-Products****Substance**

Hydrogen Fluoride  
Perfluoroisobutylene (PFIB)

**Condition**

At Elevated Temperatures - greater than 200 °C  
At Elevated Temperatures - greater than 200 °C

**Hazardous Decomposition:** If the product is exposed to extreme condition of heat from misuse or equipment failure, toxic decomposition products that include hydrogen fluoride and perfluoroisobutylene can occur.

Hydrogen fluoride (CAS No. 7664-39-3) has an ACGIH Threshold Limit Value - Ceiling of 3 ppm (as fluoride), an OSHA Permissible Exposure Limit - Time Weighted Average of 3 ppm (as fluoride) and a revoked OSHA Permissible Exposure Limit - Short Term Exposure Limit (which is enforced by some State Right-To-Know programs) of 6 ppm (as fluoride). Hydrogen fluoride may cause respiratory tract irritation, dental or skeletal fluorosis and irritation or burns to the eyes or skin, particularly when dissolved in water (hydrofluoric acid). The odor threshold for HF is 0.04 ppm, providing good warning properties for exposure.

Perfluoroisobutylene(CAS No. 382-21-8) has an ACGIH Threshold Limit Value - Ceiling of 0.01 ppm. Perfluoroisobutylene may cause respiratory tract irritation, pulmonary edema, cyanosis, and effect on the hematopoietic system.

**SECTION 11: TOXICOLOGICAL INFORMATION****Product-Based Toxicology Information:**

A Material Toxicity Summary Sheet (MTSS) has been developed for this product. Please contact the address listed on the first page of this MSDS to obtain a copy of the MTSS for this product.

Please contact the address listed on the first page of the MSDS for Toxicological Information on this material and/or its components.

**SECTION 12: ECOLOGICAL INFORMATION****ECOTOXICOLOGICAL INFORMATION****Test Organism**

Water flea, Daphnia magna  
Fathead Minnow, Pimephales promelas

**Test Type**

48 hours Effect Concentration 50%  
96 hours Lethal Concentration 50%

**Result**

>1500 mg/l  
>1000 mg/l

**CHEMICAL FATE INFORMATION**

**Test Type**

20 days Biological Oxygen Demand  
Chemical Oxygen Demand

**Result**

Nil  
Nil

**Protocol**

**SECTION 13: DISPOSAL CONSIDERATIONS**

**Waste Disposal Method:** Reclaim if feasible. As a disposal alternative, incinerate in an industrial or commercial facility in the presence of a combustible material. Combustion products will include HF. Facility must be capable of handling halogenated materials. To reclaim or return, check product label for contact.

**EPA Hazardous Waste Number (RCRA):** Not regulated

Since regulations vary, consult applicable regulations or authorities before disposal.

**SECTION 14: TRANSPORT INFORMATION**

**ID Number(s):**

98-0204-0701-5, 98-0204-0703-1, 98-0204-0704-9, 98-0211-1773-8, 98-0211-1774-6, 98-0211-3998-9, 98-0211-3999-7, 98-0211-5508-4, 98-0211-6447-4, 98-0211-7938-1, 98-0211-8800-2, 98-0211-8807-7, 98-0211-8875-4, 98-0211-8882-0, 98-0211-9333-3, 98-0211-9334-1, 98-0211-9371-3, 98-0212-1104-4, 98-0212-3122-4, 98-0212-3123-2, 98-0212-3124-0, ZF-0002-0105-1, ZF-0002-0106-9, ZF-0002-0320-6, ZF-0002-0389-1, ZF-0002-1139-9, ZF-0002-1164-7, ZF-0002-4132-1

Please contact the emergency numbers listed on the first page of the MSDS for Transportation Information for this material.

**SECTION 15: REGULATORY INFORMATION**

**US FEDERAL REGULATIONS**

Contact 3M for more information.

**311/312 Hazard Categories:**

Fire Hazard - No Pressure Hazard - No Reactivity Hazard - No Immediate Hazard - No Delayed Hazard - No

**STATE REGULATIONS**

Contact 3M for more information.

**CHEMICAL INVENTORIES**

The components of this product are in compliance with the chemical notification requirements of TSCA.

All applicable chemical ingredients in this material are listed on the European Inventory of Existing Chemical Substances (EINECS), or are exempt polymers whose monomers are listed on EINECS.

The components of this product are listed on the Canadian Domestic Substances List.

The components of this product are listed on the Australian Inventory of Chemical Substances.

The components of this product are listed on Japan's Chemical Substance Control Law List (also known as the Existing and New Chemical Substances List.)

Contact 3M for more information.

## INTERNATIONAL REGULATIONS

Contact 3M for more information.

**This MSDS has been prepared to meet the U.S. OSHA Hazard Communication Standard, 29 CFR 1910.1200.**

## SECTION 16: OTHER INFORMATION

### NFPA Hazard Classification

**Health:** 3 **Flammability:** 0 **Reactivity:** 0 **Special Hazards:** None

National Fire Protection Association Hazard Codes are designed for use by firefighters, sheriffs, or other emergency response teams who are concerned with the hazards of materials under emergency conditions. These NFPA codes are intended to include the hazards of the products of decomposition or combustion in a fire situation.

### HMIS Hazard Classification

**Health:** 0 **Flammability:** 0 **Reactivity:** 0 **Protection:** X - See PPE section.

Hazardous Material Identification System (HMIS(r)) hazard ratings are designed to inform employees of chemical hazards in the workplace. These ratings are based on the inherent properties of the material under expected conditions of normal use and are not intended for use in emergency situations. HMIS(r) ratings are to be used with a fully implemented HMIS(r) program. HMIS(r) is a registered mark of the National Paint and Coatings Association (NPCA).

### Revision Changes:

Section 1: Product use information was modified.

Section 8: Respiratory protection comment was modified.

Section 3: Potential environmental effects comment was modified.

Copyright was modified.

Section 3: Potential effects from inhalation information was modified.

Section 5: Fire fighting procedures information was modified.

Section 5: Unusual fire and explosion hazard information was modified.

Section 6: Release measures information was modified.

Section 7: Handling information was modified.

Section 7: Storage information was modified.

Section 8: Skin protection information was modified.  
Section 8: Respiratory protection information was modified.  
Section 10: Hazardous decomposition or by-products information was modified.  
Section 13: Waste disposal method information was modified.  
Section 10: Materials and conditions to avoid information was modified.  
Section 16: HMIS explanation was modified.  
Section 16: NFPA explanation was modified.  
Section 15: Inventories information was modified.  
Section 9: Vapor density information was modified.  
Sections 3 and 9: Specific physical form information was modified.  
Section 5: Flammable limits (UE) information was modified.  
Section 5: Flammable limits (LEL) information was modified.  
Section 9: Property description was modified.  
Section 9: Flammable limits (LEL) information was modified.  
Section 9: Flammable limits (UEL) information was modified.  
Section 10: Hazardous decomposition or by-products comment was added.  
Section 13: Waste disposal method comment was added.  
Section 8: Skin protection - recommended gloves information was added.  
Section 8: Respiratory protection - recommended respirators information was added.  
Section 8: Skin protection - recommended gloves text was added.  
Section 8: Respiratory protection - recommended respirators text was added.  
Section 8: Respiratory protection - recommended respirators text was added.  
Section 8: Skin protection - protective clothing text was added.  
Section 8: Exposure guidelines information was added.  
Section 10: Hazardous decomposition heading was added.  
Section 8: Respiratory protection - recommended respirators text was added.  
Section 8: Skin protection - recommended gloves information was added.  
Section 11: Product-based toxicology information was added.  
Section 11: Product-based toxicology information comment heading was added.  
Section 8: Exposure guidelines data source legend was deleted.  
Section 15: WHMIS regulations comment was deleted.  
Section 15: WHMIS regulations comment heading was deleted.  
Section 15: Ingredient comment heading was deleted.  
Section 8: Exposure guidelines information was deleted.  
Section 15: Inventories comment was deleted.

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